Massachusetts Bay Transportation Authority

Lean at the MBTA

Quarterly Update

Fiscal and Management Control Board

February 4, 2019

Lean at the MBTA – Recap & Executive Summary

What is Lean?

Lean is a systematic approach to continuous improvement by applying principles and tools to eliminate waste

Why are we here?

MBTA has high level of broken processes and inefficiencies

What is our opportunity?

By providing collaboration tools and establishing approaches for employees to solve problems together, we can create lean and efficient processes that generate productivity - creating bandwidth to invest in other critical needs for the MBTA

FY19 goal

For FY19, goal is to achieve operationalized 5% ($30M) productivity targets included in operating budgets and ensure all employees have access to Lean tools and approaches

How are we doing?

Organization continues to manage to FY19 financial and operational expectations

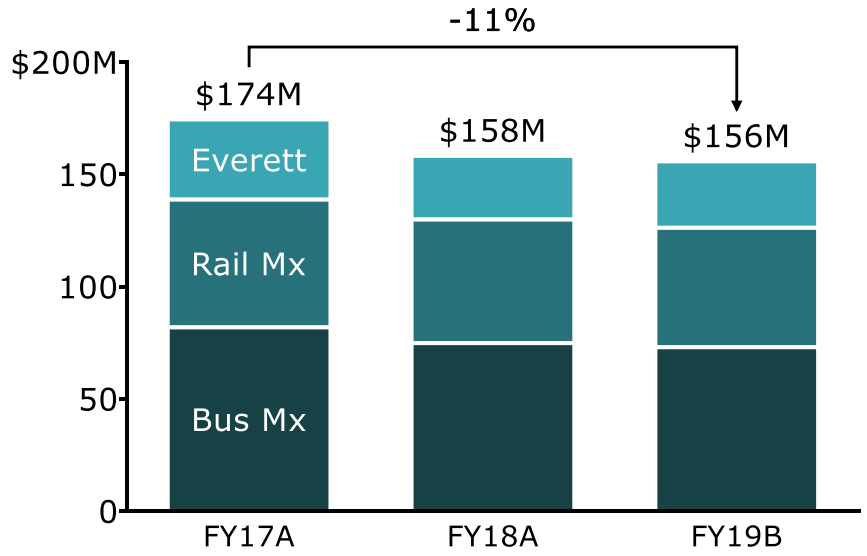
- 4 key Lean initiatives underway for highest potential/risk areas
- ~270 number of people received White Belt Training (140 MBTA)

Vehicle Maintenance – key focus area for Lean for FY19

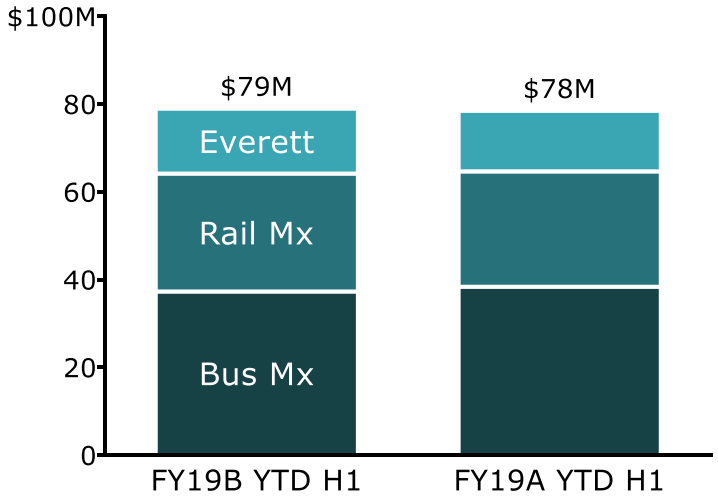
4 main objectives for Lean in FY19:

- Create tools & review processes to enable senior leadership to drive accountability
- **Directly support 4 key initiatives in Vehicle Maintenance and E&M to help drive financial and operational results – Focus of today**
- Support Lean Liaisons throughout organization to drive own improvement initiatives
- Ensure all employees have access to tools and training to empower continuous improvement

Vehicle Maintenance: Last 3 Years

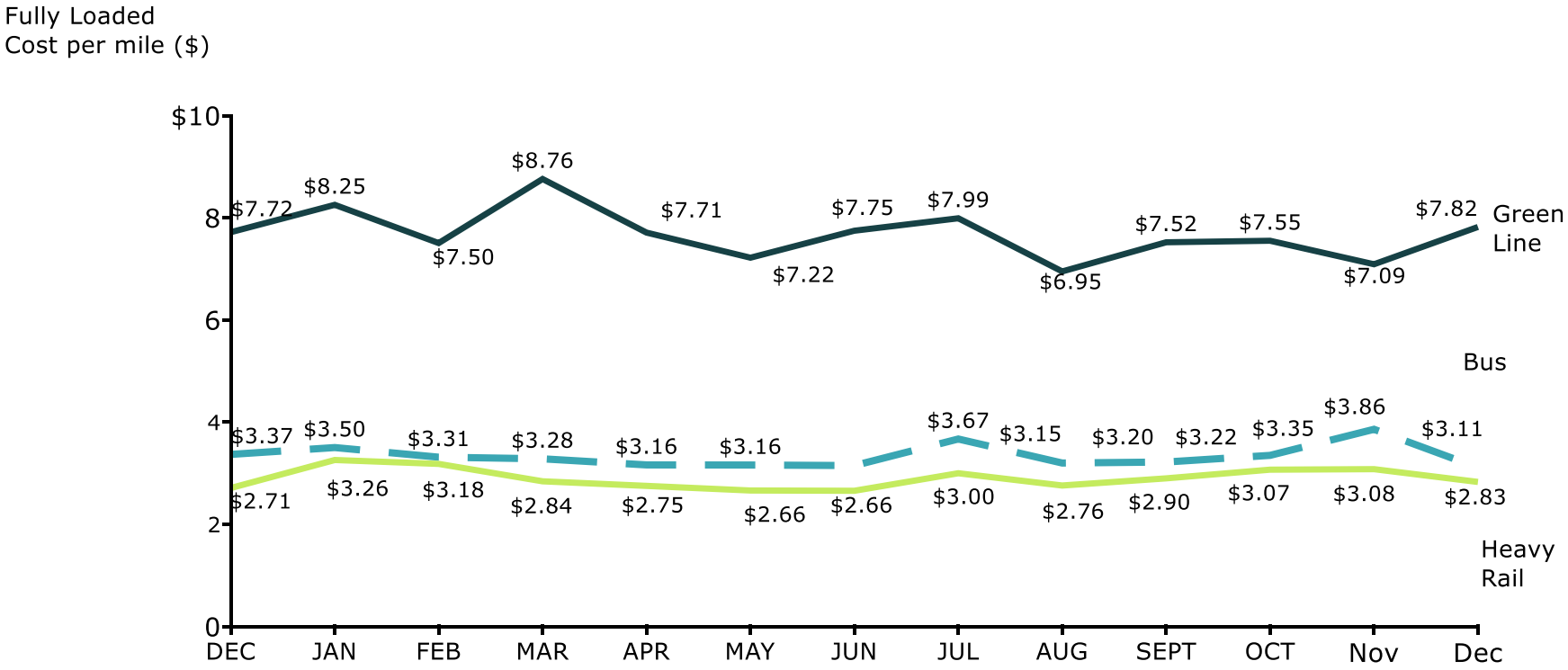


Vehicle Maintenance: Year to Date



Source: MBTA Internal Data; Vehicle Maintenance costs shown are department-level only; Does not include any fringe or benefits; Includes fuel and cleaning contracts

Fully loaded cost per mile trend – Dec. 2017 to Dec. 2018



Green Line MMBF (K)	9	10	10	8	9	7	6	6	4	5	6	7	9
Heavy Rail MMBF (K)	39	31	85	56	62	62	40	52	50	28	51	34	40
Bus MMBF (K)	24	25	26	27	23	19	19	24	30	19	23	21	24

Notes: Cost per mile for Bus include Everett Bus shop, exclude Non-Revenue Shop and North Cambridge, and exclude fuel and cleaning contract; CPM for Rail includes Everett Rail shop; fully loaded fringe costs include pension costs if funded at 5% discount rate instead of 7.75% and retire health (OPEB) costs if fully funded; Bus and Heavy Rail are weighted by mileage across garages/car houses.

Source: FMIS; MCRS2; Monthly Bus Report

Targeted Lean Efforts

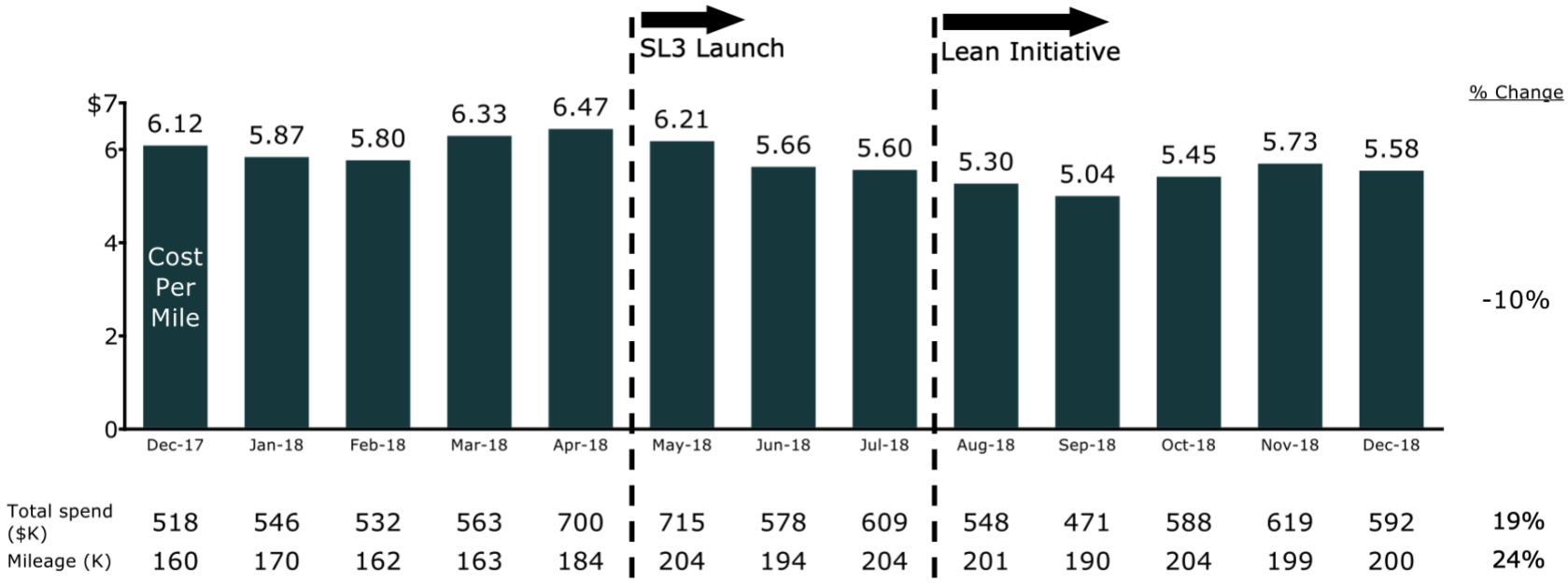
Targeted Lean efforts continue, areas of focus represent some of greatest challenges for Bus and Rail Maintenance

Focus	KPI	Q4 FY18 Average	Q1 FY19 Average	Q2 FY19 Average	Q1 vs Q2 Change	FY19 Target
Southampton Bus Maintenance	Cost per mile	$6.12	$5.32	$5.59	Increase	<$5.00
Southampton Bus Maintenance	MMBF*	13K	19.3K	8.0K	Decrease	>12.5K
Southampton Bus Maintenance	SRT&** Compliance	48%	69%	80%	Increase	>75%
Riverside Rail Maintenance	Cost per mile	$7.56	$7.49	$7.49	No change	<$7.00
Riverside Rail Maintenance	MMBF*	7K	5K	7.4K	Increase	>5K
Riverside Rail Maintenance	SRT&** Compliance	No SRTs	No SRTs	No SRTs	--	>50%
Everett Rail	Cost per mile	$0.79	$0.87	$0.85	Decrease	$0.80
Everett Rail	MMBF*	(N/A)	(N/A)	(N/A)	--	(N/A)
Everett Rail	SRT&** Compliance	No SRTs	No SRTs	9 new SRTs created	--	>50%

Note: Mileage based on 5 months of FY19 data for Southampton; Previous version of Southampton targets included more aggressive mileage targets; Total cost per mile includes fully-loaded fringe costs and Everett Allocation, Bus Maintenance costs also exclude Non-Revenue Shops and Fuel costs; Reservoir costs included in CPM listed for Riverside. Riverside has a one-time $405K favorable material adjustment due to capital project work

***Mean Miles Between Failure | **Standard Repair Time**

Southampton Cost per Mile Breakdown: $0.54 decrease from last December



- Bus fleet and staffing levels stable throughout adoption of SL3, which increased mileage by ~15-20%
- Lean Initiative launched and focused on root cause analysis and troubleshooting, driving increased efficiency in parts usage
- **Annualized cost avoidance / savings estimated to be between $500K to $1M annualized**

Note: CPM includes Everett Bus allocation and includes pension costs if funded at 5% discount rate instead of 7.75% and retire health (OPEB) costs if fully funded; ; Presumed one-time $80K cycle count credit in Sept.

Source: FMIS; MCRS2; Monthly Bus Report

Lean Initiatives at Southampton

Standardizing work

- Focused additional resources on SRT implementation and increased compliance from 50 to 80%, and created 24 new SRTs
- Standardized and trained all staff on parts issuance processes
- Dedicated locations and upkeep process for specialty tools
- Created Superintendent audits / checklists

Management best practices

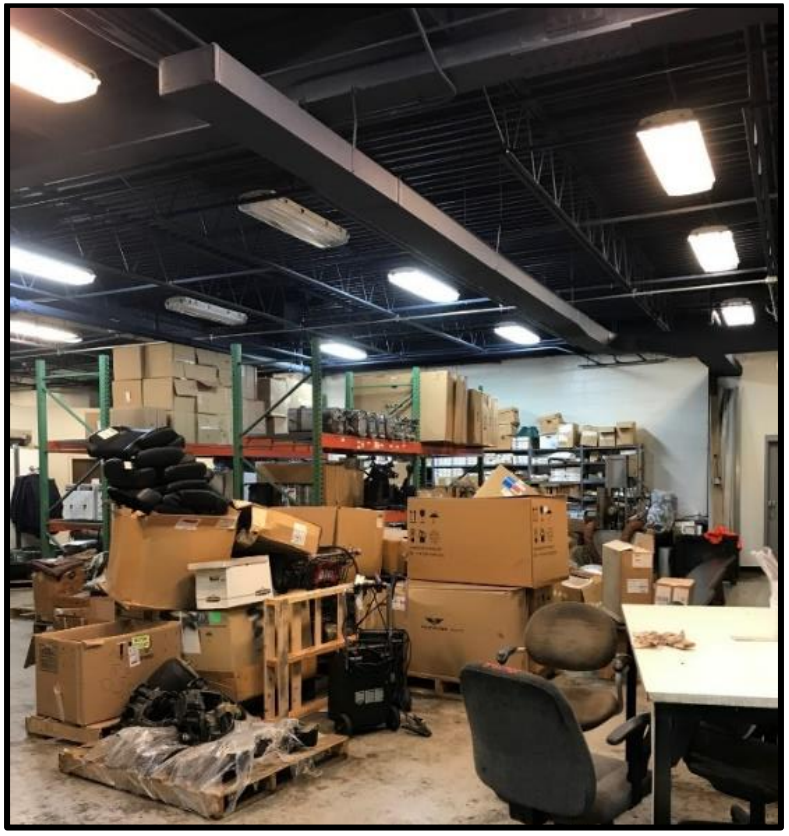
- Displayed KPI 4'x6' dashboard in foremen's office
- Launched foremen daily checklist
- Established bi-weekly executive steering committee

Training

- 9 days of training for all 18 members of 589 Union (on track to complete by 2/15/19)
- 5S Lean training for 20 members of 264 Union and 5 members of Alliance (completed)

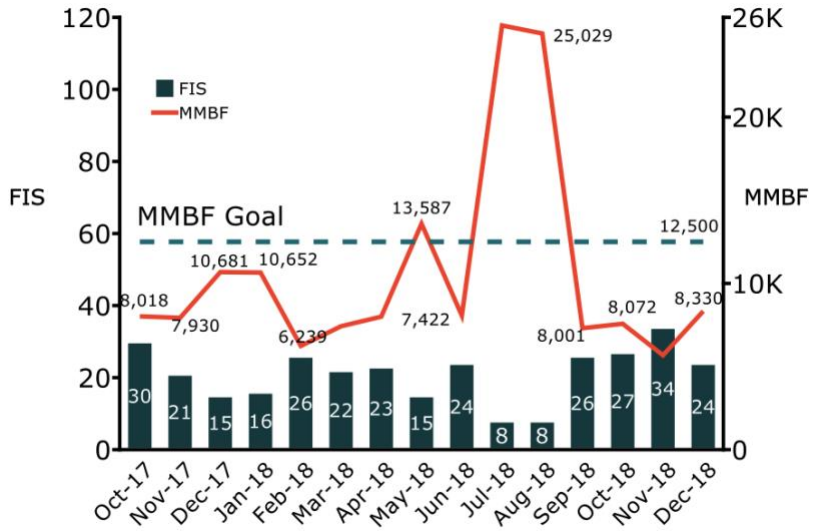
Inventory capacity increasing

- Doubled storage capacity of upstairs inventory room
- Relocated storage trailers from Cabot
- Removed 25 pallets of obsolete parts

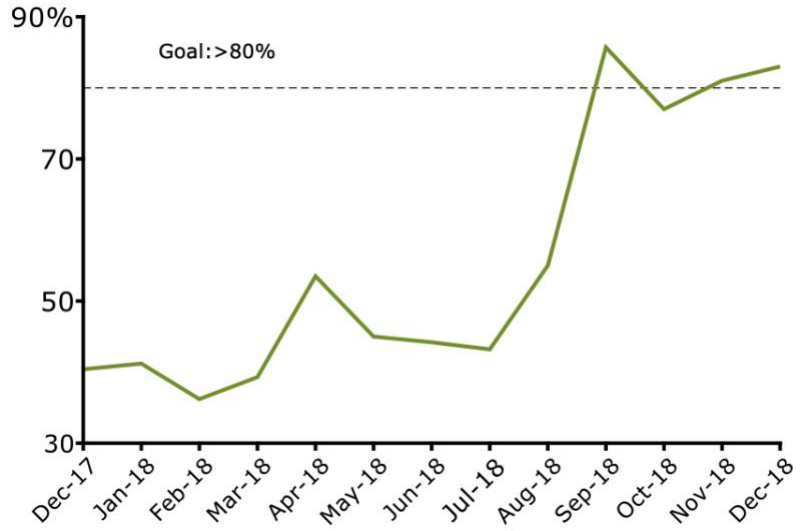


System reliability at Southampton: High level of failures in service continue to persist

MMBF and Failures in Service



Standard Repair Time Compliance



- MMBF continues to be below goal target
  - ’04 DMA’s are the oldest and most complicated bus fleet in the system
  - ’09 New Flyer Hybrids are being prepared for mid-life overhaul
  - ’45th’ bus and 5 LoNo bus pilot should improve MMBF in near future
- SRT increases due to foremen training, adherence to proper work documentation, and clear understanding from front-line to superintendent of expectations and priorities

Source: FMIS; MCRS2; Monthly Bus Report

Employee development and training

White Belt Training

Providing in-house Lean training to all interested employees via MassDOT U

- **4 hour interactive training** with option of White Belt certification
- **270 people** trained through start of December (140 from MBTA)
- **Very positive reception**
- **2 classes/month** scheduled for Q3 FY19
- **Building a community:** Lean team to reach out to all trainees to initiate new lean projects in Q3 2019

Management Skills Training

For Supervisors and Superintendents of Bus Maintenance and Operations (Completed in Dec 2018)

- **7 all-day modules** at Roxbury Community College
- **40 staff** with significant day-to-day operational responsibilities
- **Specially designed** to focus on applying strategic, performance and leadership tools to mobilize their workforce


Eight Types of Waste
38
Defect
Errors or mistakes causing the effort to be redone to correct the problem
Transportation
Moving material, Information or people
Over-processing
Processing more than necessary to produce the desired output
Information/Inventory
More information or material than needed
Over-production
Creating more material or information than needed
Motion
Movement by employees to access/process material or information
Waiting
Waiting for materials/information; work in progress/waiting to be processed
Underutilization
Losing improvement opportunities by not engaging or listening to employees
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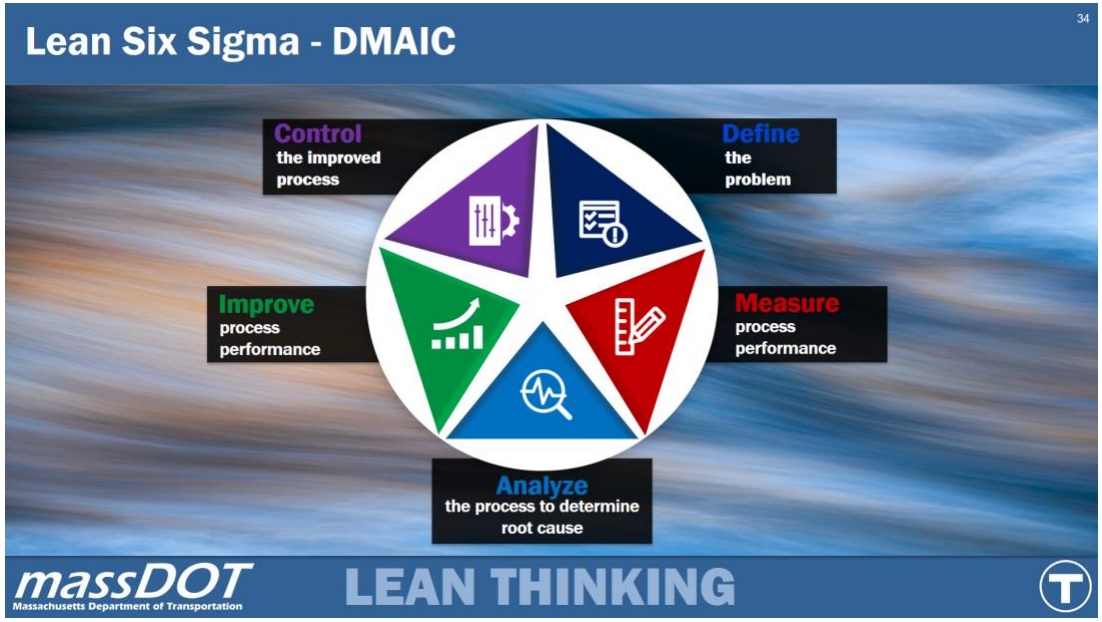
LEAN THINKING


Lean Six Sigma - DMAIC
34
Control
the improved process
Define
the problem
Improve
process performance
Measure
process performance
Analyze
the process to determine root cause
massDOT
Massachusetts Department of Transportation
LEAN THINKING

Appendix

New projects completed or in implementation in Q2 FY19

(not exhaustive of productivity-related work by organization)

Department	Project	Impact	Estimated cost avoided or savings
Customer Experience	New process and material for updated maps in revenue vehicles using 3rd party for printing and installation	• Map installation by advertising vendor estimated to take **2 weeks vs. at least one month** in prior process • Maps will be printed on less expensive, recyclable, easier to install material	~$140K per system update
Budget & Finance	Implementing tighter controls over employee time charged to capital projects	• Improved accuracy for charging labor • **Increased transparency** of payroll errors for operational leadership and opportunity to correct errors	~$2M / year re-allocated to appropriate capital projects
Environmental / Capital Delivery	Develop new process and standards to assist Project Managers in identifying environmental permitting needs, progress, and milestones	• Ability to identify necessary permits early **reduces risks of project delays and costly change orders** • Eliminating delays spanning from several weeks to months	N/A
Environmental	Assess strategies to reduce energy demand charges paid by the MBTA and provide actionable initiatives	• Proposal to run existing generators at Everett and Cabot during peak demand surges and install new generators, **lowering peak demand from grid** • Financial assessment of battery system installation	~$600K annually (proposed)

Department	Project	Impact	Estimated cost avoided or savings
Scheduling & Planning	Revise schedule card printing process to eliminate unnecessary printing	• Full sets of schedule cards now printed only 2x / year rather than 4x / year • **Reduced environmental footprint and printing costs**	~$35K annually
Procurement / Warehouse	Designed and executed process to obsolete bus parts out of central warehouse and base locations	• **Freed up 500 pallets of inventory space** across Stoughton warehouse and individual bus garages, reducing need for additional storage capacity • **Project timeline cut in half** following Lean partnership	~$50K (one-time)
OCC / Training & Safety	Digitization of ROW re-certification course to be implemented in FY20	• **Reduced course time significantly** and updated course material • Decreased labor hours for trainers and less time spent traveling and in training for students	~$500K annually (proposed)

Note: Financial impact estimates average hourly wage of $40/hour with a fully-loaded fringe costs